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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/580,560

05/26/2006

Koji Kudo

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EXAMINER

NIU, XINNING

ART UNIT

PAPER NUMBER

2828

MAIL DATE

DELIVERY MODE

12/14/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/580,560

Applicant(s)

KUDO ET AL.

Examiner

Xinning(Tom) Niu

Art Unit

2828

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 May 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17, 21 and 23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17, 21 and 23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 May 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 05/26/2006, 01/24/2007.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 16, 23 objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Applicant claims a laser array in dependent claims 16 and 23 when the parent claim is directed to a single distributed feedback laser.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1, 2, 3, 6, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Y. Itaya et al. "Low Threshold Current GaInAsP/InP DFB Laser," IEEE J. Quantum Electron, Vol. QE-23, NO. 6, June 1987, pp. 828-834 in view of Cimini, Jr. et al. (5,091,916).

4. Regarding claim 1, Itaya et al. disclose: a distributed feedback laser comprising an active region for generating the gain of a laser beam and a diffraction grating formed in said active region (page 829, Left column); the front end surface out of the front and the back end surface between which said active region is interposed has a reflectivity of 1 percent or less, the back end surfaces out of said two end surfaces has a reflectivity of 30 percent or more when viewed from the back end surface side toward the front (page 830, right column, page 831); the coupling coefficient κ of said diffraction grating is 100 cm^{-1} or more (page 829, left column), the length L of the active region is $150\text{ }\mu\text{m}$ or less (page 29, right column); using a small active region to achieve a lower threshold current (page 828, right column). Itaya et al. do not disclose: a combination of κ and L so that these parameters provide $\Delta\alpha/g_{\text{th}}$ of 1 or more. However, Cimini, Jr. et al. disclose: increasing the side mode suppression ratio by increasing the gain difference between modes (Col 5, Lines 9-26) It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the laser device of Itaya et al. by increasing the side mode suppression ratio and reduce the threshold current which results in $\Delta\alpha/g_{\text{th}}$ of 1 or more in order to produce a laser device which requires less power to operate.

5. Regarding claim 2, Itaya et al. disclose: the coupling coefficient κ of said diffraction grating is 100 cm^{-1} or more (page 829, left column), the length L of the active region is $150\text{ }\mu\text{m}$ or less (page 29, right column). Therefore, the product of the coupling coefficient and the active region length is at least 1 and not more than 3.

6. Regarding claim 3, Itaya et al. disclose the claimed limitations except active region length L is not longer L_p value, where the L_p value is the length of the active region at the peak of a curve of $\Delta\alpha/g_{\text{th}}$ vs. active region length. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the laser device of Itaya et al. by modifying the active region length and grating in order to reduce the threshold current.

7. Regarding claim 6, Itaya et al. disclose: back end surface of the active region is formed by etching and the longitudinal direction length of the entire device including the distributed-feedback semiconductor laser is longer than $150\text{ }\mu\text{m}$ (page 830, Col 2).

8. Regarding claim 17, please see the rejection for claim 1.

9. Claims 4,5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Y. Itaya et al. "Low Threshold Current GaInAsP/InP DFB Laser," IEEE J. Quantum

Electron, Vol. QE-23, NO. 6, June 1987, pp. 828-834 in view of Cimini, Jr. et al. (5,091,916) and McCall, Jr. et al. (4,740,987).

10. Regarding claims 4, 5, Itaya et al. disclose the claimed limitation except: diffraction grating has a structure that is refractive index coupled and $\lambda/4$ shifted, and the $\lambda/4$ shift position is at a distance 75 percent along the length of the active region measured from the front facet. However, McCall, Jr. et al. disclose: quarter-wave phase slip introduced at a point in the grating (Col 2, Lines 49-61). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the laser device of Itaya et al. as modified by introducing a quarter-wave phase slip in order to enhance mode selectivity.

11. Claims 7-15, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Y. Itaya et al. "Low Threshold Current GaInAsP/InP DFB Laser," IEEE J. Quantum Electron, Vol. QE-23, NO. 6, June 1987, pp. 828-834 in view of Cimini, Jr. et al. (5,091,916) and Aoki. et al. (2003/0021319).

12. Regarding claim 7, Itaya et al. disclose the claimed limitations except: laser device so structured to include another function region integrated behind the distributed feedback semiconductor laser through an end surface gap formed by said etching process. However, Aoki discloses: laser device in which laser back was prepared by using known dry etching techniques, and light output monitor (116) integrated with the

laser (Figures 2, 3; 0026] [0227]). vetching the laser and integrating a light output unit in order to monitor the output laser light.

13. Regarding claim 8, please see the rejection for claim 7.

14. Regarding claim 9, Itaya et al. as modified disclose the claimed limitations except: front end surface of said other function region is formed tilted relative to the back end surface of said active region. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the laser device of Itaya et al. as modified by tilting the front end surface of the other function region in order to improve the coupling of light into the light receiving section.

15. Regarding claims 10, 21, the light receiving section (external reflector) is provided behind the distributed feedback laser and inherently reflects a portion of the light emitting by the laser.

16. Regarding claims 11 and 12, Aoki discloses: facet with high reflection film having a reflection factor of 97% ([0025]). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the laser device of Itaya et al. as modified by forming an antireflection form with a higher reflection factor in order to reduce the threshold current.

17. Regarding claim 13, the back facet is formed on the high reflection film and is a window that guides light out of the active region.

18. Regarding claim 14, Itaya et al. as modified disclose the claimed limitations except: active region comprise at least one material selected from the group of Al, N and Sb. However, Aoki discloses: laser with active region comprising InGaAlAs. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the laser device of Itaya et al. as modified by using the InGaAlAs material system and forming a DFB laser in order to modify the emission wavelength.

19. Regarding claim 15, Itaya et al. as modified disclose the claimed limitations except: distributed-feedback laser has a series resistance within a certain range. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the resistance of the laser device, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

20. Claims 16, 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Y. Itaya et al. "Low Threshold Current GaInAsP/InP DFB Laser," IEEE J. Quantum Electron, Vol. QE-23, NO. 6, June 1987, pp. 828-834 in view of Cimini, Jr. et al. (5,091,916) and Macomber et al. (5,610,930).

21. Regarding claims 16 and 23, Itaya et al. as modified disclose the claimed limitations except: a distributed feedback laser array wherein the distributed feedback semiconductor lasers have different wavelengths from each other. However, Macomber et al. disclose: DFB laser array emitting at different wavelengths (Figure 1, Col 5, Lines 18-35, Col 6, Lines 32-51). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the laser device of Itaya et al. as modified by incorporating it into an laser array of Macomber et al. in order to emit light at different wavelengths.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Xinning(Tom) Niu whose telephone number is 571-270-1437. The examiner can normally be reached on M-T, 7:30-5:00 EST, Alternate Fridays 7:30-4:00 ES.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Min Sun Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Xinning Niu
12/05/2007

A handwritten signature in black ink, appearing to be 'Minsun Oh', written over a faint rectangular stamp area.

**MINSUN OH HARVEY
PRIMARY EXAMINER**